# DESCRIPTIONS OF AUSTRALIAN EOLIDACEA (MOLLUSCA: OPISTHOBRANCHIA)

## 3. THE GENERA *TULARIA, EMBLETONIA* AND *AUSTRAEOLIS,* WITH A NOTE ON *TERGIPES PAUCULAS* BURN, 1962.

By ROBERT BURN*

Text figures 1-18.

## SUMMARY

The diagnosis of the Favorinid genus *Austraeolis* Burn (1962) is completed by a study of more material, and two new species, *A. westralis* and *A. benthicola,* are described. A new Eubranchid genus *Tularia* is described with *Cuthona bractea* Burn (1962) as type species, and the Cuthonid *Embletonia gracilis* Risbec (1928) is recorded from Australia for the first time. A re-examination of *Tergipes pauculas* Burn (1962) shows it to be a mutilated specimen of *Babaiella serrata* (Baba, 1949).

## INTRODUCTION

The first two papers in this series (1963, 1964) dealt with the Australian species of the genera *Nossis* Bergh (1902), *Eubranchus* Forbes (1838), *Trinchesia* Ihering (1879), *Toorna* Burn (1964) and *Herviella* Baba (1949). Seven species were described and figured. The present paper deals with three more genera, *Tularia* gen. nov., *Embletonia* Alder and Hancock (1851) and *Austraeolis* Burn (1963), and five species of which two are described as new.

The material examined for this research has been deposited in the National Museum of Victoria, Melbourne (N.M.V.), the Australian Museum, Sydney (A.M.), or the Western Australian Museum, Perth (W.A.M.), depending upon the State of origin.

The writer wishes to thank in particular the Trustees of the Science and Industry Endowment Fund, C.S.I.R.O., for a grant in aid of research on the Australian opisthobranchs. This paper is part of a comprehensive study of the Opisthobranchia of Australia being undertaken by the writer. Due acknowledgement is also made to the Directors and Molluscan Departments of the National Museum of Victoria, Melbourne, the Australian Museum, Sydney, and the Western Australian Museum, Perth, for the loan of material and literature.

## SYSTEMATIC SECTION

ORDER NUDIBRANCHIA
SUBORDER EOLIDACEA
SUPERFAMILY ACLEIOPROCTA
FAMILY EUBRANCHIDAE

---

* Hon. Associate in Conchology, National Museum of Victoria, Melbourne, Victoria.

## *TULARIA* gen. nov.

*Diagnosis*: Acleioproct Eolidacea with triseriate radula (median tooth denticulate, lateral teeth plate-like without denticles) and a single row of denticles on the masticatory borders; with simple or roughened rhinophores and tentaculiform foot corners; without penial gland or prostatic vas deferens, penis unarmed; right liver with 4 simple rows of cerata.

Type species: *Cuthona bractea* Burn (1962: 110).

*Remarks*: *Tularia* has several special negative characteristics hitherto not recognized among Eubranchid genera or species, i.e., absence of penial gland, prostatic vas deferens and penial stylet. The genus is otherwise very close to *Eubranchus* Forbes, 1838 (Lemche, 1964: 40-44); which has rounded foot corners and penial gland. Tentaculiform foot corners and unarmed penis occur in *Galvinella* Eliot (1907), but that genus has cerata on the middle of the back and the anus in the middle line. *Egalvina* Odhner (1929) has a simple penis and very distinctive laterally branching liver rows. *Cumanotus* Odhner (1907) has an unarmed penis, two hook-bearing pads at the genital aperture and finely denticulate rhachidian and lateral teeth. *Capellinia* Trinchese (1874) has a stylet arming the penis.

*Tularia* originated from an Australian aboriginal word 'tulari', meaning a species of fish.

### *Tularia bractea* (Burn).

Figures 1-4.

*Cuthona bractea* Burn, 1962: 110, fig. 11-12.

*Material examined*: VICTORIA: Point Danger, Torquay; 31 March, 1963, 1 specimen, N.M.V. reg. no. F25,654; 18 January, 1965, 1 specimen, N.M.V. reg. no. F25,655; both specimens collected by the writer.

*Habitat*: Crawling on brown algal tips in tide pools, under stones at low tide level (Burn, loc. cit.).

*Description*: The two topotypical specimens examined alive were respectively 10 and 14 mm. long. The smaller specimen was yellowish in colour with the lower two-thirds of the rhinophores mauve, some larger cerata were purple on the outer side and some smaller lateral ones had a dark orange superficial pigment; the cnidosacs were yellowish, the digestive glands grey-black. The larger specimen was creamy-white, everywhere marked with bluish-white epidermal pigment patches and small orange pigment cells; rhinophores, tentacles and anterior edge of foot white; cerata greenish-yellow with a wide band of burnished red below the cream cnidosacs, everywhere marked with small orange pigment cells and shining white ceratal glands, digestive glands pale green.

Small tentaculiform foot corners are characteristic. The rhinophores are roughened. The liver branching (fig. 1) consists of four rows of up to 4, 5, 6, 6 cerata in the right liver, behind which lie six rows of up to 6, 6, 5, 4, 3, 2 cerata. The cerata are slender fusiform, finely pointed, the cnidosacs are about one-sixth the cerata length. In the larger slug, the cerata rows stand up marginally above the body sides and the lower end hangs free. The genital aperture (*b*) lies below the third and fourth rows of the right liver, the anus (*a*) opens in front of the first row posterior liver right side and the renal pore (*c*) lies in front of this.

The 0.7 mm. long pale yellow jaws (fig. 2) are elongate oval, strongly convex and thickened anteriorly. The masticatory borders have about 20 pointed denticles. The colourless radula (fig. 3) comprises 27 rows of 1.1.1 teeth plus 3-5 small rachidians in an ascus-like heap. The rachidian has a short cusp and 4-5 denticles each side; the lateral teeth are as wide as long, with a single attenuated cusp.

The reproductive organs (fig. 4) have a large reniform ampulla (*d*) which distally bifurcates to the female gland mass and the male duct. The slender vas deferens (*e*) is short and coiled, the penial sheath (*g*) large and muscular. The penis (*h*) fills the whole lumen of the sheath; it is apicially rounded and unarmed. The spermatheca (*i*) was dislodged and crushed in dissection; it is probably pyriform.

*Discussion*: Examination of topotypical specimen of *Cuthona bractea* shows that the radula is triseriate and not uniseriate as originally reported (Burn, 1962: 111). This necessitates the transfer of the species from the Cuthonidae to the Eubranchidae.

The pretty yellow coloration of *G. bractea* distinguishes it from all other Australian eolids. *Eubranchus rubeolus* Burn (1964: 13) which lives on the same coastline has a white body with red patches and dark red cerata.

## FAMILY CUTHONIDAE

## SUBFAMILY TERGIPEDINAE

### Genus *EMBLETONIA* Alder and Hancock (1851).

*Diagnosis*: Acleioproct Eolidacea with a uniseriate radula (prominent cusp and smaller lateral denticles) and a single row of denticles on the masticatory borders; with simple rhinophores, broad velum and rounded foot corners; with penial stylet and prostatic vas deferens (but no penial gland); right liver with two rows of one ceras each.

Type species by monotypy: *Pterochilus pulcher* Alder and Hancock (1844: 329), = *Embletonia pulchra*. The genus *Pterochilus* Alder and Hancock (loc. cit.) is preoccupied.

*Remarks*: This genus and *Tenellia* differ from the other Cuthonid genera, in fact all eolid genera, in that the tentacles are replaced by a broad velum. *Tenellia* A. Costa (1866) has two rows of two or more cerata in the right liver to separate it from *Embletonia*, and is further separated by the presence of a penial gland in the reproductive system.

### *Embletonia gracilis* Risbec.

Figure 5.

*Embletonia gracile* Risbec, 1928: 271, pl. 12, fig. 11, text fig. 91.
*Embletonia gracile*. Risbec, 1953: 139, fig. 94, 96.
*Embletonia gracile*. Baba, 1959: 335, pl. 29.
*Embletonia gracile*. Baba, 1963: 399.

*Material examined*: VICTORIA: Point Danger, Torquay; 3 January 1965, 1 specimen, collected by the writer, N.M.V. reg. no. F25,656.

*Habitat*: Beneath stone in channel at low tide.

## EXPLANATION OF FIGURES

Text figs. 1-4. *Tularia bractea* (Burn).
1. Right lateral view of preserved slug.
2. Jaw.
3. Radular teeth.
4. Genital organs.

Text fig. 5. *Embletonia gracilis* Risbec—dorsal view of living slug.

Text figs. 6-10. *Austraeolis ornata* (Angas).
6. Dorsal view of living slug.
7. Liver system.
8. Jaw.
9. Radular tooth.
10. Genital organs.

Abbreviations: *a*—anus; *b*—genital aperture; *c*—renal pore; *d*—ampulla: *e*—vas deferens; *f*—prostatic vas deferens; *g*—penial sheath; *h*—penis *i*—spermatheca; *j*—oviduct; *k*—penial flange.

---

*Description*: The living specimen (fig. 5) measured 4.5 mm. in length. The body was translucent white overlaid everywhere including the cerata with opaque white superficial pigment patches. Black eyes shine through the head. Digestive glands within body and cerata dull pink; cnidosacs translucent.

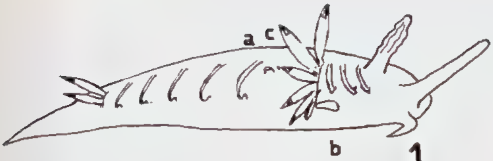
The body is fusiform, not elongate as in the type and Japanese slugs. The velum is broad, trilobate from above, but only bilobate from below. The foot corners are rounded, the sole narrow. Rhinophores short, simple and generally curved rearwards like a pair of horns. The fully developed cerata are very stout with a narrowed base and wider four-knobbed distal end. Each of the four knobs contains a small cnidosac filled with fusiform yellowish nematocysts. There are six cerata on the left side, only four on the right of which the anterior two belong to the right liver. The genital aperture lies below the cerata of the right liver, the anus opens close to the anterior base of the first ceras of the posterior liver right side. The cerata are carried nearly horizontally in life.

The animal has not been examined further.

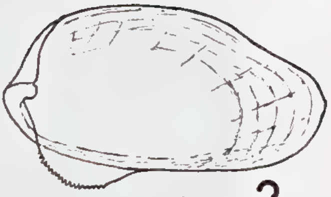
*Discussion*: With regard to the number of cerata, the specimen falls midway between *E. gracilis* with 7-8 pairs (Risbec, 1928: pl. 12, fig. 11; Baba, 1959: 335) and *E. paucipapillata* Baba (1963: 339) with 4-5 pairs. Like the former material, the specimen had short, stout cerata and for this reason alone it is identified with *E. gracilis*. However, it should be remembered that the specimen had a fusiform body which could indicate either specific or subspecific separation at a later date. *E. paucipapillata* was originally described as a subspecies of *E. gracilis*, but the slender fusiform body, fewer cerata and more delicate teeth justify specific status.

*E. paucipapillata* has been examined fully (Baba, 1963) and the genital organs figured (loc. cit.: fig. 7-8). Their structure is identical with that of *E. pulchra* (Alder and Hancock, 1844; Marcus and Marcus, 1958: pl. 18, fig. 8) except that there is no penial stylet as in the latter. Consequently, absence of a penial stylet and the peculiar four-knobbed shape of the cerata might justify generic separation for this species and its congeners.

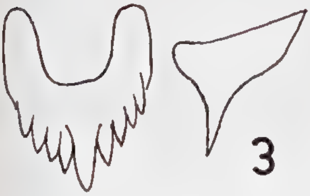
This is the first record of the genus and species from Australia. It has hitherto been found only in New Caledonia and Japan.



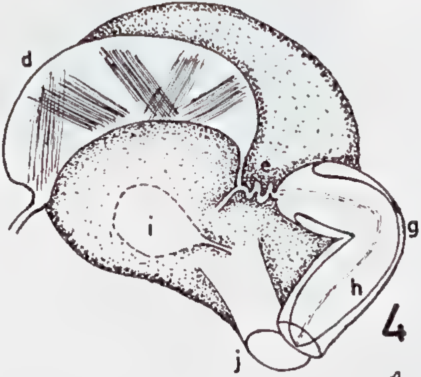
1



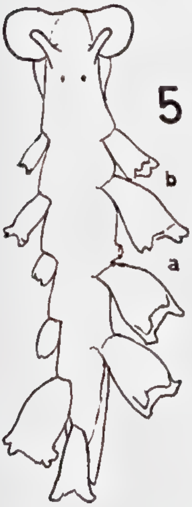
2



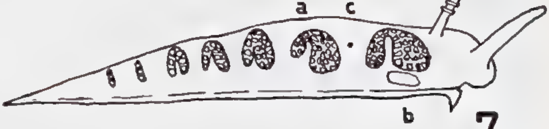
3



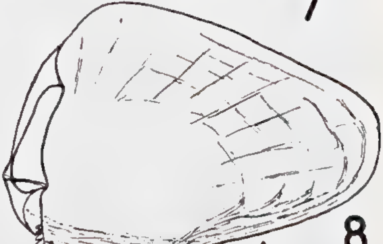
4



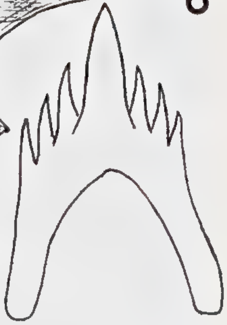
5



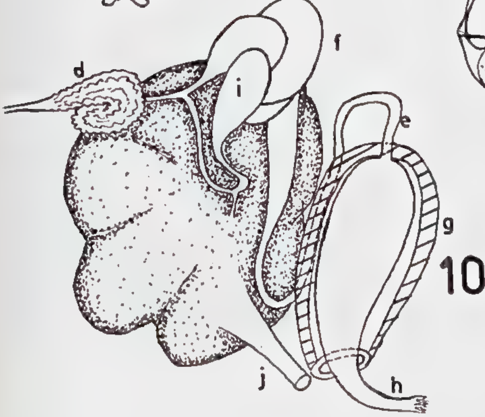
7



8



9



10

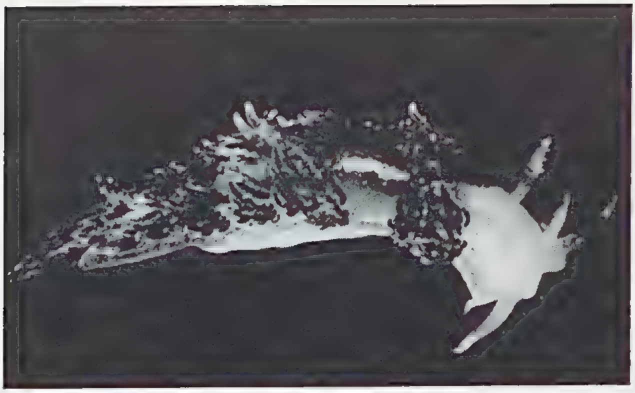


Fig. 6: *Austraeolis ornata* (Angas), Long Reef, New South Wales. Collected and photographed by A. Healy.

## NOTE ON *TERGIPES PAUCULAS* BURN (1962: 113).

A re-examination and anatomical study of the unique specimen upon which the species *Tergipes pauculas* Burn (1962: 113) is based, shows that it is none other than a mutilated but regenerating specimen of *Cratena serrata* (Baba, 1949: 105, 179; Burn, 1962: 119). As in the Japanese description and Australian specimens, the jaws are quadrate with heavily denticulate tail-like masticatory borders and the radular teeth have a long cusp with fine denticles along each side. Consequently *T. pauculas* must be placed in the synonymy of *C. serrata*. Risso-Dominguez (1964: 223) has proposed a genus *Babaiella* for *C. serrata* and places it in the family Phyllodesmidae.

## SUPERFAMILY CLEIOPROCTA

## FAMILY FAVORINIDAE

### Genus *AUSTRAEOLIS* Burn (1962: 120).

*Diagnosis*: The species of this genus are distinguished by three characteristics: (i) the asymmetrical liver arches with 4-7 irregular series of cerata on the broad anterior limb and 2-3 series of cerata on the narrow posterior limb, (ii) the ental prostatic vas deferens, and (iii) the ornamental fleshy armature of the penis. Furthermore, the three species of the genus have in common (*a*) annulate rhinophores, (*b*) tentaculiform foot corners, (*c*) a single row of denticles on the masticatory borders, and (*d*) a vertical flange on the anterior of the jaws.

Type species by original designation: *Flabellina ornata* Angas (1864: 67).

*Remarks*: The three species now referred to this genus are separated by differences in the shape of the jaws, radular teeth and penis. Externally, only *A. benthicola* is distinguished by its exceptionally wide foot. *A. ornata* is the most common eolid in eastern Australia where it ranges from Moreton Bay, southern Queensland, to Warrnambool, western Victoria. *A. westralis* is apparently common at its only known locality, Rottnest Island, south Western Australia. From the literature, *Austraeolis* appears to be peculiar to Australia.

*A. fucia* Burn (1962: 122) from Queenscliffe, Victoria, is most likely a preserved mutilated specimen of *Facelina hartleyi* Burn (1962: 116) and is not treated in this research.

### *Austraeolis ornata* (Angas).

Figures 6-10.

*Flabellina ornata* Angas, 1864: 67, pl. 6, fig. 7.
*Rizzolia australis* Bergh, 1884: 27, pl. 9, fig. 1-5.
*Flabellina ornata*. Allan, 1950: 224, pl. 28, fig. 1.
*Flabellina ornata*. Dakin, 1952: 270, pl. 62, fig.
*Hervia ornata*. Burn, 1957: 24.
*Austraeolis ornata*. Burn, 1962: 121, fig. 21-22.

*Material examined*: QUEENSLAND: Dunwich, Greenmount. NEW SOUTH WALES: Woody Head, Angourie, Minnie Waters, South-West Rocks, Long Reef, Sydney Harbour, Maroubra, Wollongong, Ulladulla. VICTORIA: Flinders, Torquay, Warrnambool. A total of 70 specimens.

*Habitat*: Crawling among large boulders and beneath stones between tide levels, often in large numbers.

*Description*: Living slugs (fig. 6) grow to 35 mm. in length; preserved they rarely exceed 20 mm. The body colour is brilliant orange mottled white and cream and with small patches of shining blue. The cerata have dark brown or black digestive glands, superficial flecks of orange, red, yellow, brown, green or blue, or any combination of these, and cream cnidosacs.

The body (fig. 7) is rather wide, pointed behind and with insignificant foot margins. Foot corners small, tentacles long and tapering, rhinophores with 6-15 annulae. Liver system with five arches and two or one single rows on each side. Anterior arches very asymmetrical, posterior arches symmetrical. The right liver has 4-7 indistinct series of cerata standing upon the broad anterior limb and three or fewer series upon the slender posterior limb. The cerata are slender fusiform. The genital aperture (*b*) lies below the anterior limb of the right liver, the anus (*a*) opens on a papilla in the apex of the first posterior liver arch right side, and the renal pore (*c*) opens in the latter part of the interhepatic space.

The pale brown jaws (fig. 8) are 3.4 mm. long in a preserved slug 21 mm. in length; trigonal in shape, they have a vertical flange projecting from the anterior edge. The masticatory borders are deep with at least 26 large and 8 small conical denticles. The 23-29 radular teeth (fig. 9) have a stout cusp and three or four denticles each side.

The genital organs (fig. 10) have a glandular ampulla (*d*) which branches to the male and female ducts. The ental vas deferens (*f*) is thick, coiled upon itself three or four times and prostatic. The ectal part (*e*) is slender and passes within the muscular wall of the penial sheath before looping to enter the base of the penis. The penis (*h*) is elongate, tapering, slighting keeled on one side and tipped by six fleshy filaments. The spermatheca (*i*) opens to the inner oviduct, its distal part nestles in the coils of the prostatic vas deferens.

*Discussion*: *A. ornata* is a very distinctive species easily recognized by its brilliant colouration in life and by its asymmetrical liver arches in preserved material. *Rizzolia australis* Bergh (1884: 27) from Sydney Harbour is anatomically identical with the present material and must be placed in the synonymy. Bergh's description should be consulted for further details of this species.

### *Austraeolis westralis* sp. nov.

Figures 11-14.

*Material examined*: WESTERN AUSTRALIA: Rottnest Island, 32° S., 115°30′ E.; north side of west end, 12 December, 1964, 1 specimen

(Holotype), R. P. McMillan, W.A.M. 180-64; Radar Reef, 3-4 January, 1965, 5 specimens (Paratypes), Shirley Slack-Smith, W.A.M. 104-65, 106-65; August, 1959, 1 specimen (Paratype), Sir Robert Blackwood, N.M.V. reg. no. F25,657.

*Habitat*: Beneath stones between tide levels.

*Description*: The largest preserved slug is 21 mm. in length. Preserved specimens have the same aspect as *A. ornata*, therefore it may be inferred that the living slugs have the coloration of that species. At present the specimens have cream bodies with brown to brown-purple cerata.

The body (fig. 11) is broad, the foot corners tentaculiform, the tentacles long, rhinophores with 12 or more annulae. Cerata in four arches and two or three single rows on each side. The right liver has 5-6 irregular series of cerata in the broad anterior limb and 2-3 series in the narrow posterior limb. The arches are more symmetrical posteriorly, the cerata are fusiform. Genital aperture (*b*) below anterior limb of right liver, anus (*a*) in the apex of the first arch posterior liver right side, renal pore (*c*) in the posterior part of the interhepatic space.

The brown jaws (fig. 12) are 3.5 mm. long in a 21 mm. long preserved slug; shape subovate, with vertical flange at anterior edge. Masticatory borders very deep with 20 large conical denticles on the lower edge and numerous small serrations above. Radula with 23 teeth (fig. 13), each with tapering cusp and 4-5 denticles each side.

Genital organs (fig. 14) generally as in *A. ornata*. Differences are narrower coiled prostatic vas deferens (*f*), larger outer vas deferens (*e*), stouter, i.e., shorter and broader penis (*h*) with numerous denticle-like fleshy serrations at the tip, and a more elongate spermatheca (*i*).

*Discussion*: *A. westralis* is outwardly all but identical with *A. ornata* from eastern Australia. Anatomical differences are more prominent in the rounded shape of the jaws, the slenderer radular teeth and the male parts of the genital organs. Without any doubt, both species have derived from a common origin within fairly recent times.

The lack of knowledge of the opisthobranch fauna of southern Australia, particularly between western Victoria and Rottnest Island, leaves open the possibility that *A. westralis* is an extreme form of *A. ornata*.

The specific name *westralis* is from the colloquial corruption 'Westralia', derived from Western Australia.

### *Austraeolis benthicola* sp. nov.

Figures 15-18.

*Material examined*: NEW SOUTH WALES: off Ulladulla, 35°20′ S., 150°30′ E., 9 August, 1944, 1 specimen (Holotype), A.M. reg. no. C.63063.

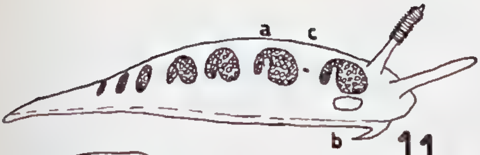
*Habitat*: Trawled on coarse sand in 80 m. depth.

*Description*: The single slug is 15 mm. long, the colour dull yellowish-grey.

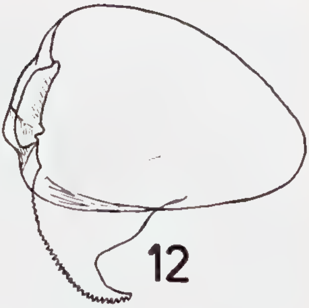
Text figs. 11-14. *Austraeolis westralis* sp. nov.
11. Liver system.
12. Jaw.
13. Radular tooth.
14. Genital organs.

Text figs. 15-18. *Austraeolis benthicola* sp. nov.
15. Right lateral view of holotype.
16. Jaw.
17. Radular tooth.
18. Ectal male genital tract.

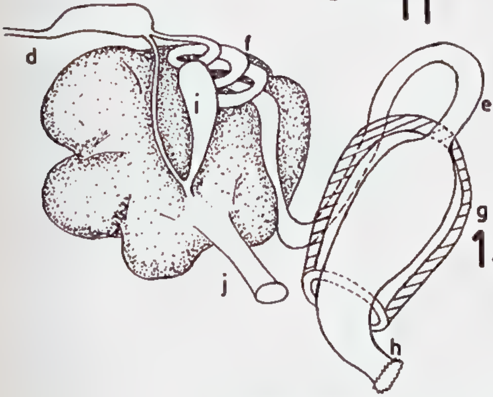
R. Burn delin.



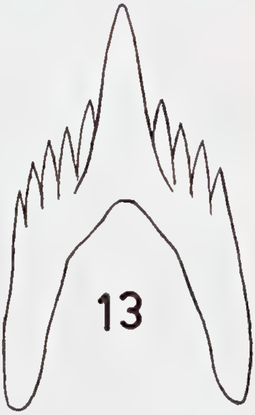
11



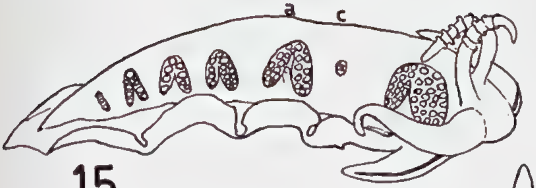
12



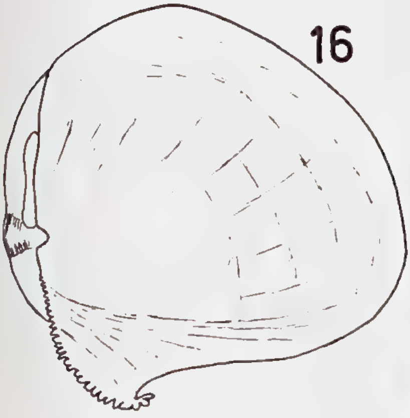
14



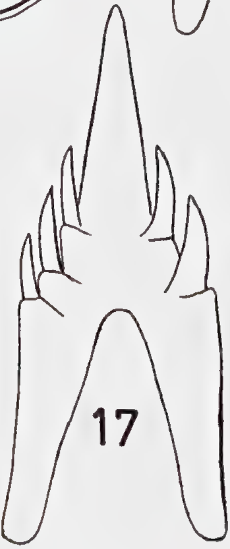
13



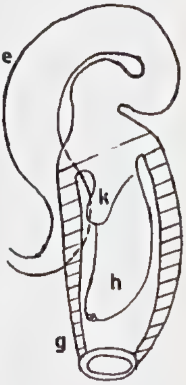
15



16



17



18

The body (fig. 15) is broad, high and attenuated behind. The foot corners are tentaculiform and large, the tentacles very wide at the base and sharply tapered, the rhinophores very long with five annulae in the distal half. Foot very broad; margins 1-1.5 mm. wide are present along each side of the body and extend behind the body for 2-3 mm. Cerata in five arches and one single row each side. Right liver with 4-5 irregular series of cerata in the broad anterior limb and two series in the slender posterior limb. The arches are symmetrical posteriorly. The shape of the cerata is not known. The genital aperture (*b*) lies below the anterior limb of the right liver, the anus (*a*) opens in the apex of the first arch posterior liver right side, the renal pore (*c*) at the second-third of the interhepatic space.

The brown jaws (fig. 16) are 3.7 mm. long, ovate in shape with a vertical flange on the anterior edge. Masticatory borders short, with 30 irregularly rounded denticles. Radula with 28 long slender teeth (fig. 17), each with a large tapering cusp and 2-3 denticles each side.

The ectal vas deferens (fig. 18, *e*) is dilated and as in *A. ornata* and *A. westralis,* it passes through the muscular penial sheath before looping to enter the base of the penis. The penis (*h*) is conical and rather short; its tip has a shallow rim on one side that forms a lip upon which the vas deferens opens. A large tongue-like flap (*k*) hangs beside the penis base within the sheath (*g*).

*Discussion*: Wide foot margins, ovate jaws, slender radular teeth and the apical rim of the penis are the special characteristics of *A. benthicola,* which distinguish it from both *A. ornata* and *A. westralis.* Its habitat suggests that it will remain a very rare species.

This is the first deep-water eolid to be recorded from Australia. The specific name refers to its benthic habitat.

# REFERENCES

ALDER, J., and A. HANCOCK, 1844. Description of a new genus of nudibranchous Mollusca, with some new species of *Eolis*. *Ann. Mag. Nat. Hist.*, 13:161-166, pl. 2.

————, 1845-1855. *A Monograph of the British Nudibranchiate Mollusca*, Pts. 1-7, 438 pp., 84 pls., London (Ray Society).

ALLAN, J., 1950. *Australian Shells*. xix + 470 pp., 44 pls. Georgian House, Melbourne.

ANGAS, G., 1864. Descriptions d'espèces nouvelles appartenant à plusiers genres de Mollusques Nudibranches des environs de Port Jackson, etc. *J. Conchyliol.*, 12:43-69, pl. 4-6.

BABA, K., 1949. *Opisthobranchia of Sagami Bay*. 194 + 7 pp., 50 pls. Iwanami Shoten, Tokyo.

————, 1959. A new record of an interesting species, *Embletonia gracile* Risbec, from Japan. *Publ. Seto Mar. Biol. Lab.*, 7:335-336, pl. 29.

————, 1963. Anatomy of *Embletonia gracilis paucipapillata* n. ssp. from Osaka Bay, Japan. *Ibid.*, 11:399-402, pl. 17.

BERGH, R., 1884. Report on the Nudibranchiata. *Rep. Sci. Res. Challenger, Zool.*, 10:1-154, pl. 1-14.

BURN, R., 1957. On some Opisthobranchia from Victoria. *J. Malac. Soc. Aust.*, 1:11-29, pl. 1-3.

————, 1962. Descriptions of Victorian Nudibranchiate Mollusca, etc. *Mem. Nat. Mus., Melb.*, 25:95-128.

————, 1963. Descriptions of Australian Eolidacea, I, The genera *Catriona* and *Herviella*. *J. Malac. Soc. Aust.*, 7:12-20.

————, 1964. Ibid., 2, The genera *Nossis, Eubranchus, Trinchesia* and *Toorna*. *Ibid.*, 8:10-22.

DAKIN, W., 1952. *Australian Seashores*. 12 + 372 pp., 100 pls. Angus and Robertson, Sydney.

LEMCHE, H., 1964. *Eubranchus* Forbes, 1838 (Gastropoda): Proposed designation under the Plenary Powers of a type species, etc. Z.N. (S) 1102. *Bull. Zool. Nom.*, 21:40-44.

MARCUS, E., and E., 1958. Opisthobranchia aus dem Schill von Helgoland. *Kieler Meeresforsch.*, 14:91-96, pl. 18.

RISBEC, J., 1928. Contribution à l'étude des nudibranches Néo-Calédoniens. *Faune Colon. Franc.*, 2:1-238, pl. 1-12, A-D.

————, 1953. Mollusques nudibranches de la Nouvelle Calédonie. *Faune Un. Franc.*, 15:1-189.

RISSO-DOMINGUEZ, C., 1964. Notes on the Facelinacea, 2. On the systematic position of *Hervia serrata*, etc. *Beaufortia*, 10:222-238.